

CLAIMS

What is claimed is:

1. A neuron chip platform, comprising a charge coupled detector array device (CCD), a thin protective film over the CCD, a thin patterned film applied to the protective film to promote neuron growth, and an insulator material for insulating CCD electronics from a neuron culture.
2. The neuron chip platform of claim 1, wherein the detectors on the CCD are about 6 to 15 microns square.
3. The neuron chip platform of claim 2, wherein the protective film and the patterned film are deposited by plasma deposition.
4. The neuron chip platform of claim 3, wherein said protective film is comprised of a single, composite or multiply-layered thin film of alumina, silica, aluminum silicate, titanium oxide, tantalum oxide, silicon dioxide, aluminum oxide, titanium oxide, tantalum oxide, silicon nitride, aluminum nitride, titanium nitride and tantalum nitride, carbon, Mg, Ti, Pd, Ta, Ir, Pt, Au, parylene and combinations thereof.
5. The neuron chip platform of claim 4, wherein said protective film is about 100 to 1000 Angstroms in thickness.
6. The neuron chip platform of claim 5, wherein said patterned film is comprised of diamond-like carbon.
7. The neuron chip platform of claim 6, wherein the patterned film is about 100 to 300 Angstroms in thickness.
8. The neuron chip platform of claim 7, wherein the insulator material is comprised of any wire insulator, sealant, bonding agent, epoxy, a metal, synthetic rubber or elastomer, a polymer composition having no porosity, glass, ceramic or porcelain.
9. The neuron chip platform of claim 8, further comprising a cell culturing layer above the patterned film.

10. The neuron chip platform of claim 9, wherein said cell culturing layer is selected from the group consisting of Collagen Type I, Collagen Type IV, laminin, extracellular basement membrane proteins or combinations thereof.
11. The neuron chip platform of claim 10, further comprising neurons grown on the cell culturing layer.
12. The neuron chip platform of claim 11, further comprising a means to maintain an environment for culture of the cells on said platform to enable long-term measurement and growth, wherein said environmental maintenance means comprising a temperature adjustment means for maintaining a constant temperature, a means for circulating a culture solution, a means for supplying a mixed gas of air and carbon dioxide, and a covering means to keep the cells enclosed on the platform.
13. The neuron chip platform of claim 12, further comprising microelectrodes and conducting tracks deposited on the protective film by plasma deposition.
14. A cell potential measurement apparatus comprising
 - a. a neuron chip platform comprising a charge coupled detector device array (CCD), a thin protective film over the CCD, a thin patterned film to promote neuron growth, and an insulator;
 - b. an electrical connection means connected to the neuron chip platform;
 - c. an illumination source;
 - d. a stimulation signal supply means to be connected to the electrical connection means of the neuron chip platform for providing electrical stimulation to the cells; and
 - e. a signal or image processing means to be connected to the electrical connection means of the neuron chip platform for processing an output signal or image arising from electrical physiological activities of the cells.
15. The cell potential measurement apparatus of claim 14, wherein the neuron chip platform is detachable from the electrical connection means, the stimulation signal supply means and the signal or image processing means.

16. The cell potential measurement apparatus of claim 15, further comprising microelectrodes and conducting tracks deposited onto the protective film by plasma deposition.
17. The cell potential measurement apparatus of claim 16, further comprising a cell culturing layer above the patterned film.
18. The cell potential measurement apparatus of claim 17, wherein said cell culturing layer is comprised of Collagen Type I.
19. The cell potential measurement apparatus of claim 18, further comprising neurons grown on the cell culturing layer.
20. A method of detecting and monitoring live networks of neurons comprising the steps of:
 - a. providing a cell potential measurement apparatus of claim 17;
 - b. adding a cell culturing layer seeded with neurons;
 - c. allowing the neurons to develop neurite extensions or dendritic connections;
 - d. providing electrical or environmental stimulation to the neurons;
 - e. detecting and recording the neurons response via the CCD;
 - f. analyzing said neuron response using a signal or image processing means.